RCOF Operational Practices: Towards Objective Seasonal Forecasting

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Draft Discussion Paper

- Seasonal forecast (outlook) is the flagship activity of RCOFs
- Focus on development of objective regional seasonal forecasts in Africa, Asia-Pacific and South America
- http://www.wmo.int/pages/prog/wcp/wcasp/linkedfiles/Draft-Discussion-Paper-Objective-Regional-Seasonal-Forecasts.docx
- Living document, to be generalized to cover all regions (Reviewed by CCl, CBS, WWRP and WCRP experts) – suggestions for improvement welcome
- Considered by WMO Executive Council at its 69th session in May 2017
- This RCOF Review articulated to be a key initiative to take it forward
  - Can this workshop give rise to RCOF 2.0 ?

EC-69 Decision 4.5/2 (May 2017)
SUB-SEASONAL AND SEASONAL FORECASTING SYSTEMS

Recognizing:

1. That current use of dynamical forecasts in the process of developing seasonal climate outlooks at RCOFs is **mainly subjective** and depends on confirming or challenging the statistical results, and the blending of individual national forecasts into a spatially coherent regional outlook on the basis of expert assessment,
2. The limitations of subjective consensus-based approaches for the **usability of forecasts**, particularly at the national level, as well as the challenges they pose for evaluation of forecast skill,
3. That, at the same time, the **expert assessment** taking into account many aspects, such as current climate conditions, past statistical relationships as well as the characteristics and limitations of the models used, are also still required to formulate sub-seasonal to seasonal forecasts with better forecast skill,
4. That the longstanding RCOF process involves seasonal outlook preparation through consensus building of expert assessment, and that it is **not merely a mechanical blending** of the various forecast inputs,
5. The **rapid advances in dynamical modelling** for sub-seasonal and seasonal forecasting, operational availability of such forecasts with greater space-time resolutions, and the need to **optimize their use** in the operationalization of regional forecasting systems,
6. That further progress on operational seasonal forecasting, and the routine development of associated **tailored products for decision support**, will entail more widespread adoption of objective seasonal forecasting schemes that readily facilitate the tailoring of forecast products to support specific end uses,

Decides to consider the adoption of **objective sub-seasonal and seasonal forecasts** as an overarching technical strategy, particularly at regional and national levels, promoted through RCOFs, by adopting suitable operational practices and capacity development efforts, **to be facilitated by a global RCOF review;**

Inputs

- Dynamical forecasts from GCM systems
  - Tier 1, Coupled Atmosphere-Ocean GCM
  - Tier 2, Atmosphere GCM driven by SST (predicted/persisted)
  - Ensemble, MME, probabilistic or “continuous”
- Statistical forecasts
  - Usually driven by SST
  - Probabilistic
- Conditional climatology
  - State of ENSO, knowledge of impacts
- Observed state
- Climatology

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After Jim Renwick

Methods

- Wholly objective
  - (Skill-weighted) average or ensemble of model output
  - Possibly bias-corrected, calibrated
  - No “interpretation”
- Mostly objective
  - Use the above as a first guess, adjust by expert judgement
  - Hedging, allowing for “modest skill”
- Mostly subjective
  - Model output weighted or averaged through consensus discussion
- Wholly subjective
  - Knowledge of ENSO and other drivers, expert assessment of local effects

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Pre-COF consensus

Consolidate forecast information from multiple sources generally available. Major inconsistencies are resolved by:

- Democratic forecast combination rather than simple averaging.
- Consideration of model viability as opposed to skill (sometimes some of the predictors have weak theoretical basis).
- The large-scale structure of the forecast.
- Redefinition of regions, perhaps with examination of predictions for individual stations.
- Further analyses.

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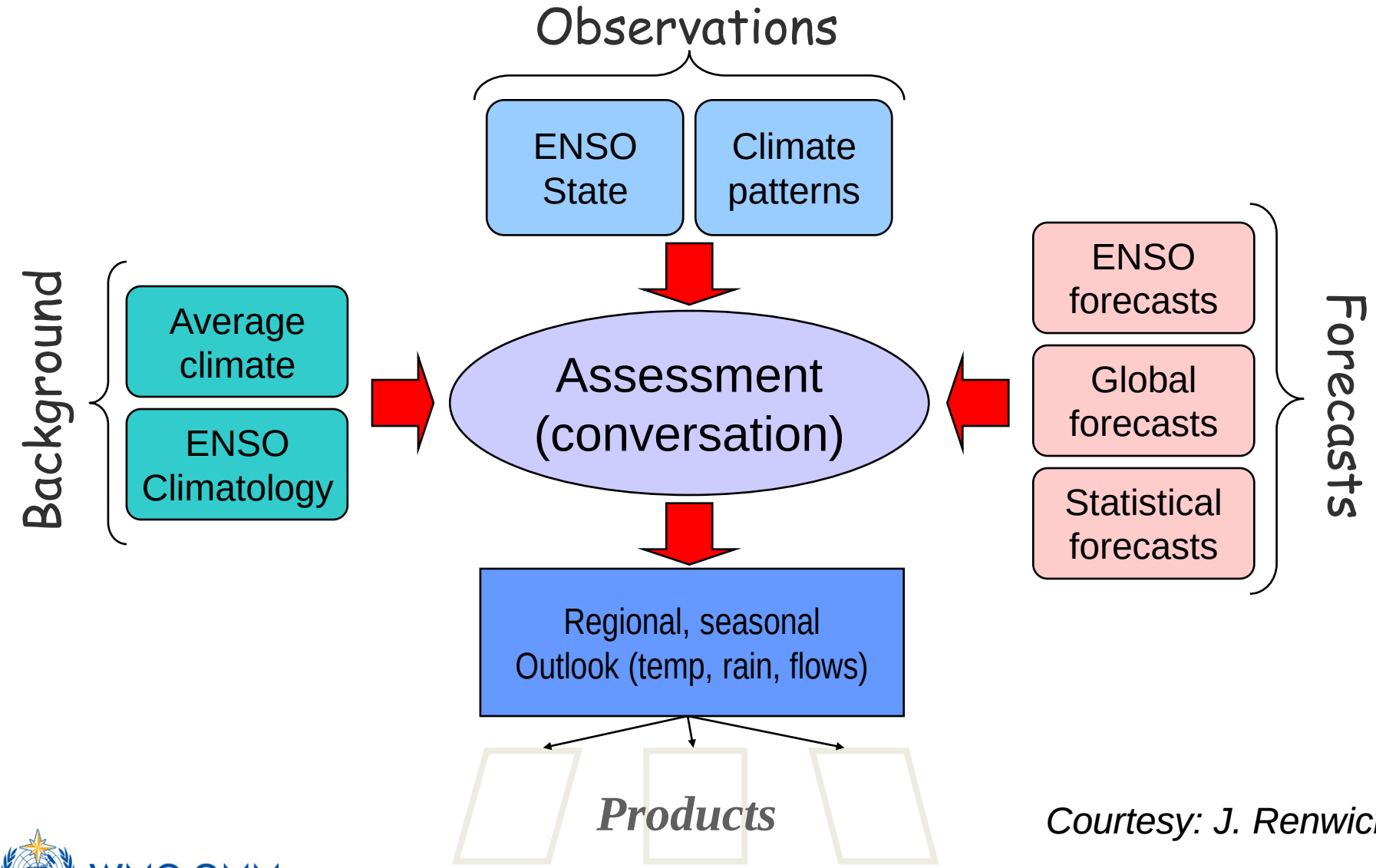
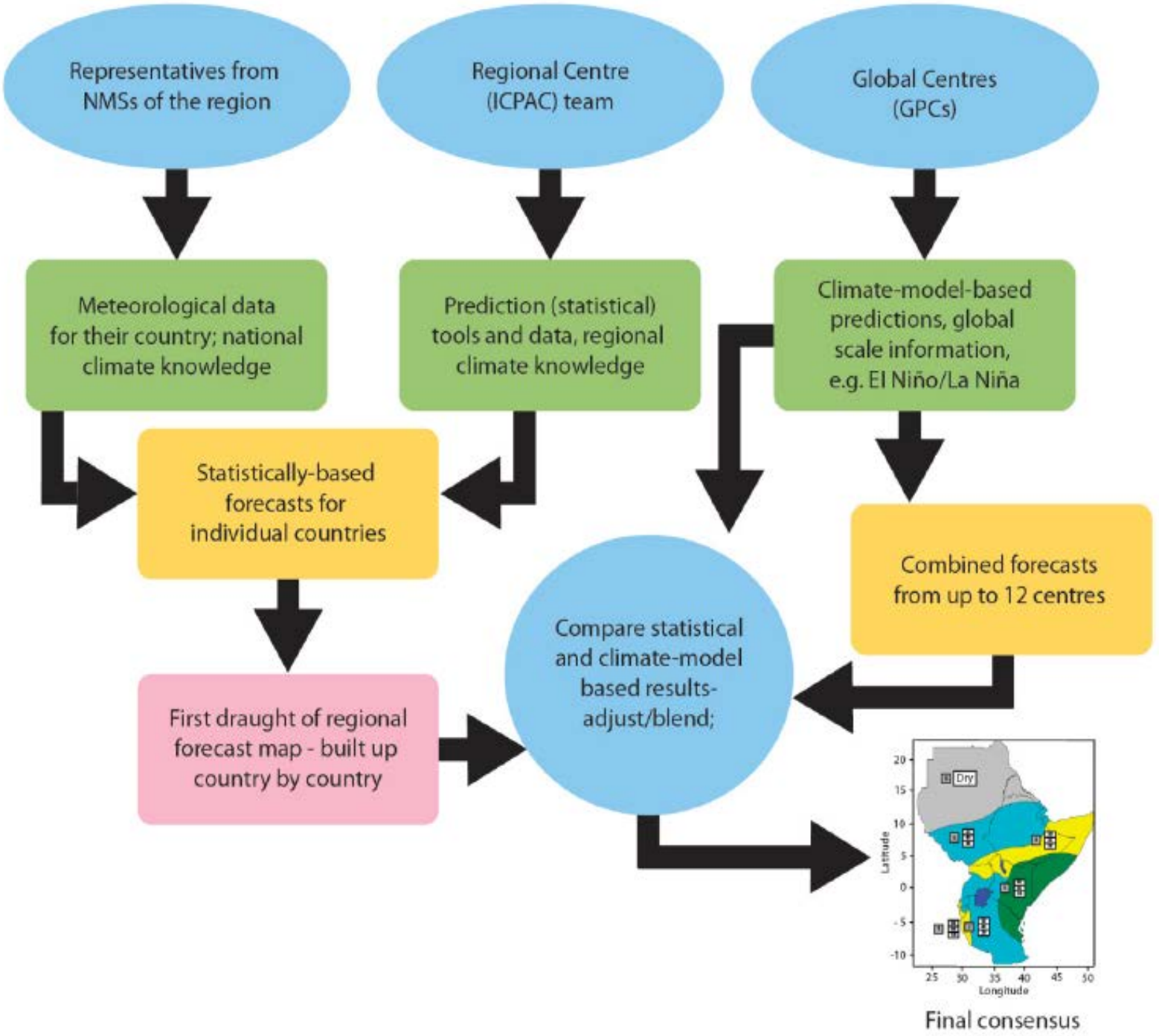
After Simon Mason

Consensus Process in RCOFs: Mostly Subjective



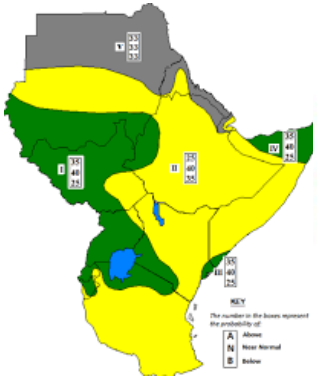
Courtesy: J. Renwick

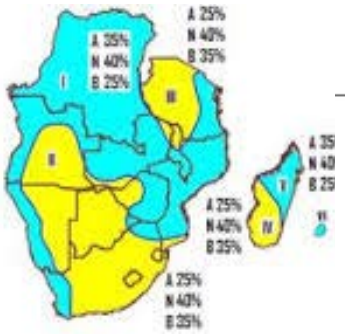
Typical Outlook Process in RCOFs

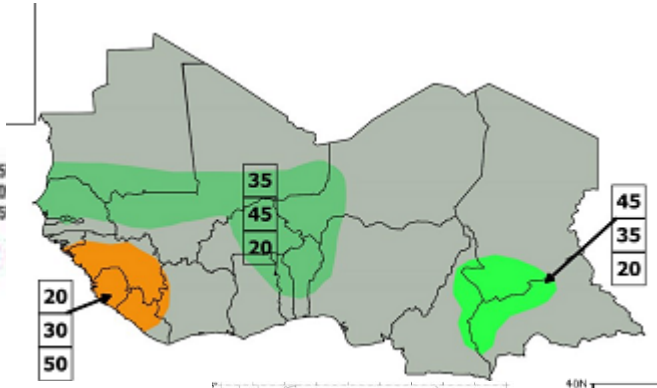


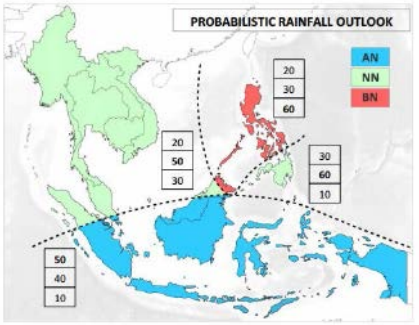
After Richard Graham

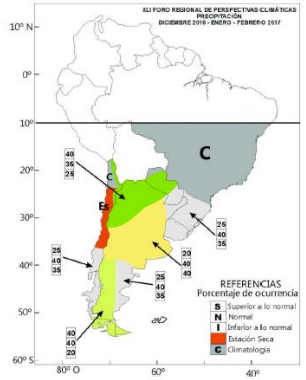
Some RCOF products worldwide

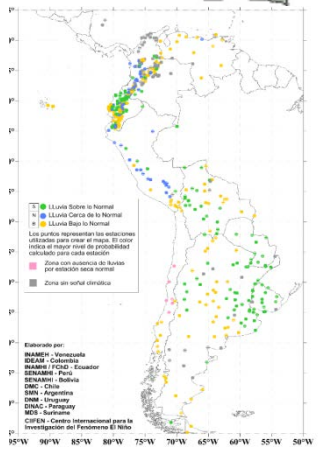


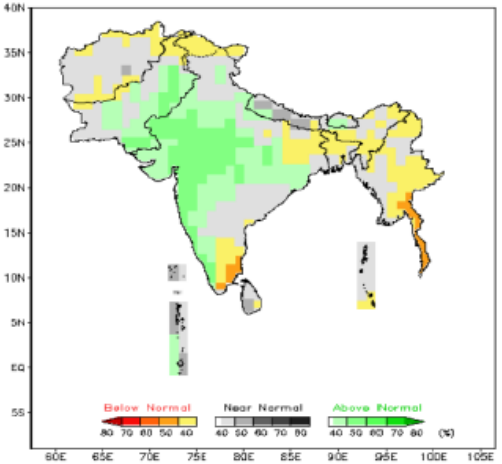


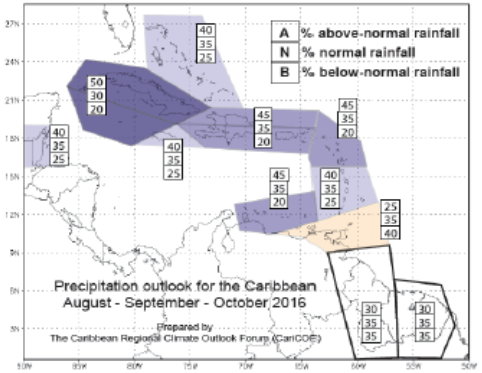


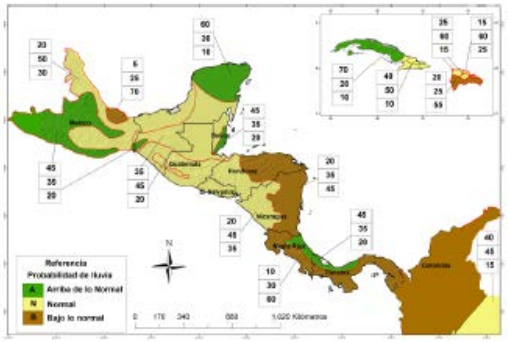


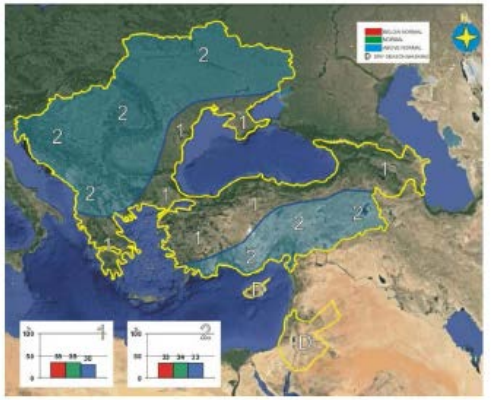












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Key Limitations of RCOF outlooks

- Format unsuitable for applications in specific decision making
- Forecast skills not routinely evaluated/communicated
- Lack of opportunities to implement new measures reflecting progress in science
- No systematic approach to provide regular updates as the target season evolves
- Very limited or even non-existent use of RCOF products or value addition at the national level
- Lack of user-tailored or targeted product packages/practical constraints to engage users at the regional level

Promoting Objective Approaches for Operational Regional Seasonal Forecasting

- CBS/CCl Technical Guidance on Operational Predictions from Sub-seasonal to Longer-time Scales (OPSLS), in collaboration with WWRP and WCRP
- Regular global workshops on Operational Climate Prediction (First: 2015 – Pune, India; Second: 2018 – Barcelona, Spain, TBC)
- Global RCOF Review follow-up
- GPC-LRF/RCC engagement – Digital data access
- Move from consensus regional outlook preparation to consensus objective approach for regional prediction (e.g., reference periods, variables, model identification/MME, calibration tools, presentation formats, verification, etc.); rule-based consensus – replicable, traceable
- Piloting of development and institutionalization of objective seasonal forecasting schemes in selected regions

Three Dimensions for Pilots

- Identification of skilful seasonal forecast methodologies for specific regions. For example,
  - Identify the global model which demonstrates the highest skill for a given regional domain
  - Identification of a Multi-Model Ensemble (MME) of global models that gives the best skill for a given regional domain
  - Maximize the exploitation of the available predictability in the system
- Identifying and accessing the necessary resources for developing and operationalizing such methodologies
  - WMO is making concerted efforts to attract extra-budgetary resources
  - Opportunities already opening up with an explicit focus on sub-seasonal and seasonal forecasting (e.g., CREWS regional/national projects)
- Assembling and coordinating the cooperation among the institutions that would be involved in further developing and operationalizing skilful seasonal forecast systems
  - GPC-LRF and RCC inputs; engagement of other institutions (e.g., IRI, APCC, C3S,…)
  - Targeting NMHS implementation (two-way interaction)
  - Co-production with climate-sensitive user sectors

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Thank you
Merci

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